302	is the right clockwise rotating forced vortex
302a	is the right forced vortex surface.
311,312	Steps, the downward acceleration of air in contact with the downward driving surfaces of the left and right forced vortices
401, 402	are the left and right air knives.
411, 412	Steps, sever entrained, accelerated air surrounding the left and right forced vortices
501, 502	are the left and air guides
511, 512	Steps, guide high velocity air away from the still or lower velocity air in contact with lower sides of the lifting surfaces.
600	is the gross payload lifted by the lifting surfaces. The gross payload is: the assembly generating the lift, the remainder of the aircraft that the load mechanism is incorporated in, and the aircraft's cargo.
601, 602	are the left and right lifting surfaces
601a, 602a	are the proximal edges for the left and right lifting surfaces.
601b, 602b	are the distal edges for the left and right lifting surfaces.
601c, 602c	are the dihedral planes that are defined by the proximal and distal edges for the left and right lifting surfaces.
610	is an imaginary plane of bilateral symmetry which bisects the angle between the dihedral planes of the lifting surfaces as well as bisecting the craft in which they are incorporated into a left half and a right half. The left half of the craft is the mirror image of the right half of the craft.
611, 612	Steps, rotate fresh surfaces of left and right forced vortices into contact with upper sides of the lifting surfaces 601 and 602.
621, 622	Steps, transmit lifting force to payload resulting from pressure differentials caused by having high velocity vortex associated air in contact with the upper surfaces of the load couplers, and by having still or lower velocity air in contact with the lower surfaces of the load couplers.
601d, 602d	are the left and right dihedral angles subtended by the plane of center lines, 630, and the dihedral planes, 601c and 602c.
630	is the imaginary plane of center lines defined by the center lines for the half-cylinder lifting surfaces.

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703 is the annular left rear vortex seal.

703a is the orifice in the left rear vortex seal.

702 is the right front vortex seal.

704 is the annular right rear vortex seal.

704a is the orifice in the right rear vortex seal.

711 Steps, seal both ends of left vortex, 301, with the to prevent outward radial motion of the air in it.

712 Steps, seal both ends of right vortex, 302, with the to prevent outward radial motion of the air in it.

insert

801, 802 - are the left and right air evacuators or pumps such as turbines.

insert

811, 812 Steps, evacuate or pump air out of the cores of the left and right forced vortices through the orifices, 703a and 704a in the left and right rear vortex seals, 703 and 704.

821, 822 Steps, draw turbulent air inward once the upward moving surfaces of the left and right forced vortices, 301 and 302, have cleared the upper edges of the left and right load couplers, 601 and 602.

831, 832 Steps, replace inwardly drawn, turbulent air from surfaces of the left and right forced vortices, with the more laminar air surrounding the surfaces the left and right forced vortices.

Drawing Figures

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Figure 1 is an end view 2D block drawing showing the imaginary planes: the plane of bilateral symmetry 600, the lifting surface center line plane 630, the dihedral plane, 601c, for left lifting surface, 601, and the dihedral plane, 602c, for the right lifting surface, 602. The planes are used for purposes of reference to describe spatial relationships between components of this invention.The drawing also shows the proximal and distal edges, 601a and 601b of the left lifting surface and the proximal and distal edges, 602a and 602b, to the right lifting surface. The proximal and distal edges of the lifting surfaces define the dihedral planes.

Figure 2 is an end view block diagram showing the power plant 100 and impellers 201 and 202 and impeller spokes sets 201c and 202c. The power plant is shown as a single entity but can be a pair of gas turbines. One for the left impeller and one for the right impeller.

Figure 3 is an end view block diagram showing power plant 100 applying torques, represented by solid arcs, to impellers 201 and 202 in steps 211 and 212. The diagram also shows

complete steps 211 and 212 to form forced vortices 301 and 302. The block diagram also shows the defined surfaces, 301a and 302a, of the forced vortex.

Figure 6 is an end view block diagram showing the spacial relationships between the lifting surfaces, 601 and 602, the air guides, 501 and 502, and the intersection of the those elements to form the air knives 401 and 402.

Figure 7 is an end view block diagram showing the spacial relationships between the impellers, 201 and 202, the lift surfaces, 601 and 602 and air guides, 501 and 502.

Figure 8 is an end view block diagram showing the spacial relationships between the forced vortices, 301 and 302, their surfaces 301a and 302a, and the lift surfaces, 601 and 602, air guides, 501 and 502.

Figure 9 is an end view block diagram of volumes of air that are near to the forced vortices 301 and 302 being accelerated downward by frictional forces generated by vortices 301 and 302. Those volumes are shown as being separated from the vortices 301 and 302 by the air knives, 401 and 402, once those volumes reach those air knives. As those volumes continue to move downward they are shown being guided away from the underside of the lifting surfaces 601 and 602 by the air guides, 501 and 502

Figure 10 is an end view block diagram depicting, with arrows, the centrifugal forces acting on a forced vortex causing it to spread radially and draw air into its core because its ends are unsealed. The white circle in the center of the vortex diagram represents slow moving air with little angular momentum that has been drawn into the core.

Figure 11 is an end view block diagram that is an end view of the of the vortex seals positioned relative to the lifting surfaces 201 and 202 and air guides, 501 and 502.

Figure 12 is a side view block diagram that is a side view that shows how the front and rear vortex seals, 702 and 704, are positioned relative the right impeller, 202 and the lifting surface 602.

Figure 13 is a side view block diagram. It highlights the position of air knife, 402, and air guide, 502 relative to the rest of the apparatus generating the lift process.

Figure 14 is a block diagram, right side view of the lift producing assembly, showing air being extracted from the core of the forced vortex, 302, by the air pump, 802. The drawing also shows the right vortex seals 702 sealing each end of forced vortex 302. Left vortex 301 simultaneously undergoes an identical processes.

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Figure 15 is a side view block diagram showing the creation of turbulence near to the surfaces of the lift surfaces, 601 and 602, in steps, 631 and 632, for the purpose of reducing air

insert ~~add~~ viscosity.

Figure 16 This diagram also shows steps 831 and 832. Those steps are the replacement of the chaotic air drawn inward, in steps 821 and 822, with laminar air drawn from just outside the forced vortices surfaces. The spiral arrows show the streamlines that the chaotic air follows. The streamlines are concentric to the lifting surfaces while inside the half-cylinder lifting surfaces, 601 and 602. The streamlines spiral inward outside of the lifting surfaces.

Figure 17 is a block diagram of showing the orientation of the lifting surfaces 601 and 602. The proximate sides of 601 and 602 protect more than half of the upward driving surfaces of forced vortices, 301 and 302, carrying out steps 641 and 642. The distal sides of lifting surfaces 601 and 602 protect less than half of the downward driving surfaces of forced vortices, 301 and 302, and, because of that, enhance steps 311 and 312, the downward acceleration of the air around the exposed surfaces of forced vortices, 301 and 302. All aircraft that produce lift by the Bernoulli effect create a downwash of air as a by product. There can be no lift generated aerodynamically unless net downward momentum is imparted to the air surrounding aircraft lifting surfaces. The orientation of the lifting surfaces is intended to maximize that downwash of air without sacrificing much upward facing surface areas of the lifting surfaces, 601 and 602.

Figure 18 shows the location of all the bodies of air interacting with the assembly generating the lift process. It shows the low pressure forced vortices, 301 and 302, that are in contact with the upper surfaces of 601 and 602. It shows the downwashes created in steps 311 and 312 when the air in contact with 301 and 302 is accelerated downward. And lastly, it shows the higher pressure, lower velocity air that is protected and maintained by the air knives, and air guides in steps 411 and 412, and steps 511 and 512.

Figure 19 shows the forces acting on the lifting surfaces, 601 and 602. Forces are vectors and are usually represented, graphically, with arrows. The forces generated by the load couplers 601 and 602 are represented by heavy straight arrows in the drawing. Because the lifting surfaces are tilted the forces generated by 601 and 602 are also tilted.

The figure also shows the four bodies of air created by the lift process: the left and right forced vortices 301 and 302, the down wash of entrained air created in steps 311 and 312, and the low velocity high pressure air protected by air guides 401 and 402.

Figure 20 is a vector diagram showing the total lifting force resulting from steps 621 and 622

Figure 21 is a block diagram that shows, symbolically, the resultant lifting force, created by steps 621 and 622, acting on the payload. That resultant lifting force acts on the lift

Figure 22 is 3D drawing of the lifting surfaces 601 and 602

Figure 23 is a 3D drawing of the air guides 501 and 502

Figure 24 is 3D drawing that shows the intersection of lifting surfaces with the air guides to form the air knives, 401 and 402. Figure also shows the distal edges, 601a and 602a, and proximal edges, 601b and 602b of the left and right lifting surfaces

Figure 25 is 3D drawing of the impellers, 201 and 202

Figure 26 is 3D drawing of the vortex seals, 801 and 802

Figure 27 is 3D drawing of the impellers positioned within the lifting surfaces

Figure 28 is 3D drawing of the complete set of aerodynamic surfaces from the rear also showing the projection of the impeller drive shafts through the rear vortex seals.

Figure 29 is 3D drawing the assembly that produces the lift process. It includes all the aerodynamic surfaces plus block representations of the power plant, 100 and the air pumps 701 and 702.

Figure 30 is a 2D block drawing of the right side view of a sample embodiment of a craft that employs the apparatus and lift process that is the subject of this patent application.

Figure 31 is a 2D block drawing showing the top view of a sample embodiment of a craft that employs the apparatus and lift process that is the subject of this patent application. --

delete ~~change to figure 1~~

~~Figure 32~~ ~~is an end view 2D block drawing showing the imaginary planes: the plane of bilateral symmetry 600, the lifting surface center line plane 630, the dihedral plane, 601c, for left lifting surface, 601, and the dihedral plane, 602c, for the right lifting surface, 602. The planes are used for purposes of reference to describe spatial relationships between components of this invention.The drawing also shows the proximal and distal edges, 601a and 601b of the left lifting surface and the proximal and distal edges, 602a and 602b, to the right lifting surface. The proximal and distal edges of the lifting surfaces define the dihedral planes.~~

Description

A typical embodiment of the mechanism producing the lift generating process that is the present invention is illustrated in the rear view 3D Figure 29.

Impellers

A hollow, cylindrical left impeller or rotor, 201, and a hollow, cylindrical right impeller or rotor, 202, are side by side with a space between them as shown in 3D Figure 25. Both the left impeller and the right impeller have an axis of rotation. Those axes are also parallel and side by side. In

seals are equal in size and larger than the diameters of the drive shafts of the impellers as shown in Figure 26.

The rear vortex seals, 703 and 704, each have an inner surface and an outer surface. The inner surfaces of the rear seals, 703 and 704, face the impellers 201 and 202 and are perpendicular to the center lines of the lifting surfaces, 601 and 602.

Impeller Drive Shafts Extend Through Rear Vortex Seals

The rear ends of the drive shafts of the impellers, 201 and 202, extend through the circular holes, 703a and 704a, past the outer surfaces of the rear vortex seals of 703 and 704. The center lines of the drive shafts are colinear with the center lines of the circular holes. Between the circumferences of the drive shaft and the circumferences of the holes are even margins of space as shown in Figure 28.

Air Pumps Attach to Rear Vortex Seals

A left air pump, 801, attaches to the outer surface of the rear vortex seal of 703 by fixed means. A right air pump, 802, attaches to the outer surface of the other rear vortex seal, 704, also by fixed means as shown in Figure 29. The air pumps devices such as turbines.

The air pumps each have an inlet. Those inlets are aligned with the holes, 703a and 704a, in the rear vortex seals, 703 and 704 so that air can flow through the holes and into the inlets of the air pumps. The regions of the rear vortex seals, 703 and 704, surrounding the air pump inlets, 703a and 704a are attached to the rest of the air pumps by fixed air tight means.

Power Plants Attach to Air Pumps and to Impellers

A power plant 100 attaches to left air pump 701 and right air pump,702, attaches to the left air by transmissive means as shown in Figure 29. The power plant, 100 is also attached to the left impeller, 201, and right impeller, 202, by transmissive means. The power plant can take the form of two separate power plants such as gas turbines. A left power plant, 101, can power the left air pump, 701, and rotate the left impeller,201. A right power plant, 102, can power the right air pump,702, and rotate the right impeller, 202. Gas turbine power plants can additionally supply thrust for a craft that uses the lifting process and apparatus that is the subject of this patent.

Operation

Referring now to the accompanying drawings:

Rotating Impellers

power plant 100 applies a counter clockwise torque to impeller 201 in Step 110 and applies a clockwise torque to impellers 202 in Step 120 as shown in Figures 1 and 3.

Impeller 201, in Step 211, imparts counterclockwise angular momentum to the volume of air imbedded in the volume swept out by the impeller. That step creates forced vortex 301 and maintains it as shown in Figures 1 and 5.

Creating Forced Vortices

Impeller 202, in Step 212, imparts clockwise angular momentum to the volume of air imbedded in the volume swept out by the impeller. That step creates forced vortex 302 and maintains it as shown in Figures 1 and 5.

A forced vortex by definition is one in which all the fluid in it has the same angular velocity. That is contrasted with a to a natural vortex in which the angular velocity of the constituent fluid varies as 1/r, where r is the radial distance from the vortex axis.

Forced vortices are created by imparting an angular velocity to the periphery of a body of fluid. Drag soon causes the interior portions of that body of fluid to rotate with the same angular velocity as the exterior portions of that body of fluid.

The rotation of impellers, 201 and 202, forces the cylindrical bands of air between the impeller blades of each impeller to rotate with the same angular velocity, on average, as the impeller blades. The volumes air inside those cylindrical bands of air is acted on by drag and rapidly acquires the same angular velocity as those outer volumes as shown in Figures 4 and 5.

The outer edges of the volume swept out by those impellers is defined as the surfaces of the forced vortices as shown in Figure 8.

The volumes of air outside the forced vortices are also pulled along by drag. Those volumes behave as though they were a constituents of natural vortices. The velocities of those volumes falls off inversely as their distance from the axis of rotation for the impellers. For example the velocity for those outer volumes at 2 radii from the axis of rotation is 1/2 velocity of the outer edges of the of the impellers and at 3 radii is 1/3, etc. Where a radius is the distance to the outer edge of the impeller from the axis of the impeller. ~~The velocity profiles of the volumes of air surrounding the forced vortices is represented graphically in Figure 18 by the radial gradients in the~~

delete

delete - ~~areas surrounding the images of 301 and 302. The darkest areas represent the highest velocity air while the lightest areas represent the slowest velocity air.~~ The velocity profiles of the volumes of

insert - air surrounding the forced vortices are shown in Figures 18, 19, 20.

The forced vortices should essentially be side by side and should have axes that are substantially parallel shown in Figures 5. The axes of the vortices in all end view drawings are perpendicular to the page and thus are parallel to each other. That is true of the impellers also shown in Figures 2,3, 7 and 25 as well as many others.

Cancellation of Reactive Torques

Impeller 201 transmits clockwise reactive torque in Step 221, to power plant 100. Impeller 202 transmits counter clockwise reactive torque in step 222, to power plant 100. Reactive torques transmitted to power plant 100, in Steps 221 and 222, cancel out in Step 230 as shown in Figure 2.

The forced vortices have essentially identical properties except for rotational directions, which are opposite as shown in Figure 5 and others.

Sealing Ends of Forced Vortices

The left vortex seals, 701 and 703, seal both ends of forced vortex 301 to create a partial vacuum in Step 711. Likewise the right vortex seals, 702 and 704, seal both ends of forced vortex 302 to create a partial vacuum in Step 712. Figure 14 shows Step 712 for the right forced vortex 302 only while Figure 11 shows the sealing the front sides of both vortices. The maintenance of the partial vacuum in the vortices keeps the centrifugal forces from pulling them apart as shown in Figure 10.

Energy spent in moving air radially outward is wasted. Only air moving tangentially to the forced vortex surfaces contributes to the development of lift.

Imparting Downward Momentum to Surrounding Air

The forced vortex 301 in Step 311 and forced vortex 302, in Step 312, entrain and accelerate masses of air near their surfaces downward shown in Figures 9 and 18.

Soon after air entrained by forced vortices 301 and 302 has gained downward momentum it reaches the air knives 401 and 402. There most of the entrained air separates from the surfaces of the forced vortices, 301 and 302, in Steps 411 and 412 as shown in Figure 18.

Once air with downward momentum separates from the surfaces of the forced vortices by the